



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION III
1650 Arch Street
Philadelphia, Pennsylvania 19103-2029

Decision Rationale
Total Maximum Daily Loads (TMDLs) for
Bacteria and Nutrient Impairments on the St. Jones
River Watershed, Delaware

Signed

Jon M. Capacasa, Director
Water Protection Division

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I. Introduction

The Clean Water Act (CWA) requires a Total Maximum Daily Load (TMDL) be developed for those water bodies identified as impaired by a state where technology-based and other controls will not provide for attainment of water quality standards. A TMDL is a determination of the amount of a pollutant from point, nonpoint, and natural background sources, including a margin of safety (MOS), that may be discharged to a water quality-limited waterbody.

This document will set forth the U.S. Environmental Protection Agency's (EPA) rationale for approving the TMDLs for the bacteria and nutrient impairments on the St. Jones River Watershed. EPA's rationale is based on the determination that the TMDLs meet the following eight regulatory conditions pursuant to 40 CFR §130.

- 1) The TMDLs are designed to implement applicable water quality standards.
- 2) The TMDLs include a total allowable load as well as individual waste load allocations (WLAs) and load allocations (LAs).
- 3) The TMDLs consider the impacts of background pollutant contributions.
- 4) The TMDLs consider critical environmental conditions.
- 5) The TMDLs consider seasonal environmental variations.
- 6) The TMDLs include a MOS.
- 7) There is reasonable assurance that the TMDLs can be met.
- 8) The TMDLs have been subject to public participation.

II. Background

The St. Jones River watershed is located in Southeastern Delaware. It is a tributary to Delaware River. There are eight listed segments in the St. Jones River watershed; they range from its headwaters to mouth. The watershed is approximately 23,000 acres in size with agricultural lands making up the majority (42 percent) of the land uses within the watershed. Forest, developed and wetlands make up 8, 30 and 15 percent of the land area respectively. Additional land use data can be found in Section 3.1 of the TMDL Report.

In response to Section 303(d) of the CWA, the Delaware Department of Natural Resources and Environmental Control (DNREC) listed eight segments in the St. Jones River Watershed (DE290-001 through 004 and L01 through L03) on its 1996 Section 303(d) list as being unable to attain the criterion for dissolved oxygen (DO) and/or bacteria. This decision rationale will address the TMDLs for the bacteria and nutrient (DO) impairments.

The bacteria impairment in this watershed is based on elevated levels of enterococcus detected in the water column. The State of Delaware's criteria for enterococcus is a geometric mean not to exceed 100 colony forming units (cfu)/100 milliliters (ml) and a single sample maximum not to exceed 185 cfu/100 ml. The concentration of enterococcus in each of these waters exceeded both criterion and they were therefore listed as not supporting the primary contact usage. Table 1 documents the TMDL loading for the nutrient and bacteria TMDLs.

The nutrient TMDLs for the impaired waters demonstrate that the current nutrient loadings do not support the applicable water quality criteria. In 1996, the State of Delaware listed each of these waters for low DO levels in water column samples collected during the assessment period. The findings were confirmed in later water column samples collected by the state. Waters found to be impaired are then targeted for a more intensive study, as part of the TMDL, which includes additional water quality monitoring and modeling. During the TMDL phase, the nutrient loading to the impaired waters was modeled to determine if a DO impairment was evidenced. If a DO impairment is not observed, the water is determined not to have a nutrient impairment. The nitrogen and phosphorous concentrations observed in the impaired waters from 2002 through 2003 were above the upper bounds of the state's screening concentrations (3 mg/l and 0.2 mg/l respectively), and found to impact the DO concentrations negatively. The TMDL analysis found that reductions in nutrients were required to attain the DO criteria on the impaired waters. Table 1 identifies the nutrient loadings to the impaired waters.

Table 1 - Summarizes the Specific Elements of the TMDLs in Daily Loads.

Stream Name	Pollutant	TMDL	WLA	LA	MOS
St. Jones River	Nitrogen (lb/d)	869.5	31.0	838.5	Implicit
St. Jones River	Phosphorous (lb/d)	63.38	3.78	59.60	Implicit
St. Jones River	Enterococcus (cfu/d)	1.7E+11	1.5E+10	1.5E+11	Implicit

The United States Fish and Wildlife Service and the National Marine Fisheries Service have been provided with copies of the TMDLs.

III. Discussion of Regulatory Conditions

EPA finds that Delaware has provided sufficient information to meet all of the eight basic requirements for establishing TMDLs for bacteriological and nutrient impairments on the impaired water. EPA is therefore approving these TMDLs. EPA's approval is outlined according to the regulatory requirements listed below.

1) The TMDLs are designed to meet the applicable water quality standards.

Delaware has indicated that excessive levels of enterococcus due to nonpoint sources have caused violations of the water quality criteria and designated uses on the impaired waters. The water quality criterion for enterococcus is a geometric mean 100 cfu/100ml or an

instantaneous standard of no more than 185 cfu/100ml. The applicable water quality criterion for DO is an instantaneous minimum concentration of 4.0 mg/l and a daily average concentration no less than 5.5 mg/l. Delaware does not have state adopted criterion for either nitrogen or phosphorous, but uses threshold concentrations of 3.0 mg/l and 0.2 mg/l for nitrogen and phosphorous respectively. Water quality data collected by the state found violations of the DO criteria and nutrient thresholds.

The Hydrologic Simulation Program Fortran (HSPF) was used as the landside model for the TMDL. Through the use of weather, stream and land use data, the HSPF model was able to determine the runoff flow and nonpoint source load. The Estuary and Coastal Ocean Model (ECOMSED) was the hydrodynamic model used for the TMDLs. ECOMSED is a three dimensional, time dependent coastal circulation model. The Row Column Aesop (RCA) model which is coupled to ECOMSED computed water quality within the tidal cycle. Through the use of these models, DNREC was able to assess the impacts of nutrient loads to the dissolved oxygen levels in the stream and able to assess the bacteriological concentrations as well. Nutrients needed to be reduced by 40 percent while bacteria loads required a 90 percent reduction for water quality standards to be attained.

2) The TMDLs include a total allowable load as well as individual waste load allocations and load allocations.

Total Allowable Loads

Delaware indicates that the total allowable loading is the sum of the loads allocated to land based precipitation driven nonpoint source areas and point sources. The total allowable load is calculated on a daily basis.

Waste Load Allocations

EPA regulations require that an approvable TMDL include individual WLAs for each point source. According to 40 CFR § 122.44(d)(1)(vii)(B), "Effluent limits developed to protect a narrative water quality criterion, a numeric water quality criterion, or both, are consistent with assumptions and requirements of any available WLA for the discharge prepared by the state and approved by EPA pursuant to 40 CFR § 130.7." Furthermore, EPA has authority to object to the issuance of any National Pollutant Discharge Elimination System (NPDES) permit that is inconsistent with the WLAs established for that point source.

Delaware has stated that there are three regulated point sources discharging within the impaired watershed. These sources are Reichold Chemicals (DE0000591), Dover McKee Run (DE0050466) and Dover Municipal Separate Storm Sewer System (DE0051161). The first two facilities discharge non-contact cooling water into the St. Jones River. The WLAs for these facilities have been provided in Table 2.

Table 2 - WLAs for the Impaired Watershed

Pollutant	Reichold Chemicals	Dover McKee Run	Dover MS4
Total Nitrogen (lb/day)	1.5	7.7	21.8
Total Phosphorous (lb/day)	0.13	0.24	3.41
Enterococcus (cfu/day)	5.7E+08	1.1E+09	1.3E+10

Load Allocations

The LAs established with the nutrient and bacteria TMDLs were categorized by land use category. Each land use category--urban, agriculture, forest, pasture and wetlands--were given a LA. Please see Table 6 in the TMDL reports for the LA breakdown in edge of stream loads.

3) The TMDLs consider the impacts of background pollution.

The TMDLs consider the impact of background pollutants by considering the bacteria and nutrient loads from all sources.

4) The TMDLs consider critical environmental conditions.

According to EPA's regulation 40 CFR § 130.7 (c)(1), TMDLs are required to take into account critical conditions for stream flow, loading, and water quality parameters. The intent of this requirement is to ensure that the water quality of the impaired waters is protected during times when it is most vulnerable.

Critical conditions are important because they describe the factors that combine to cause a violation of water quality standards and will help in identifying the actions that may have to be undertaken to meet water quality standards¹. Critical conditions are a combination of environmental factors (e.g., flow, temperature, etc.), which have an acceptably low frequency of occurrence. In specifying critical conditions in the waterbody, an attempt is made to use a reasonable "worst-case" scenario condition. For example, stream analysis often uses a low-flow (7Q10) design condition because the ability of the waterbody to assimilate pollutants without exhibiting adverse impacts is at a minimum. The TMDLs were developed based on data collected in 2002 and 2003. These are dry and wet years respectively. Therefore, the TMDLs consider critical dry and wet weather conditions.

5) The TMDLs consider seasonal environmental variations.

¹EPA memorandum regarding EPA Actions to Support High Quality TMDLs from Robert H. Wayland III, Director, Office of Wetlands, Oceans, and Watersheds to the Regional Management Division Directors, August 9, 1999.

Seasonal variations involve changes in stream flow and loadings as a result of hydrologic and climatological patterns. In the continental United States, seasonally high flows normally occur in early spring from snow melt and spring rain, while seasonally low flows typically occur during the warmer summer and early fall drought periods. The TMDL model considered seasonal variation by capturing all four seasons in both a dry and wet year.

6) The TMDLs include a margin of safety.

This requirement is intended to add a level of safety to the modeling process to account for any uncertainty. The MOS may be implicit, built into the modeling process by using conservative modeling assumptions, or explicit, taken as a percentage of the WLA, LA, or TMDL. Delaware included an implicit MOS in the TMDL through the use of conservative modeling assumptions.

7) There is a reasonable assurance that the TMDLs can be met.

EPA requires that there be a reasonable assurance that the TMDLs can be implemented. WLAs will be implemented through the NPDES permit process. According to 40 CFR § 122.44(d)(1)(vii)(B), the effluent limitations for an NPDES permit must be consistent with the assumptions and requirements of any available WLA for the discharge prepared by the state and approved by EPA. Furthermore, EPA has authority to object to issuance of an NPDES permit that is inconsistent with WLAs established for that point source.

Nonpoint source controls to achieve LAs can be implemented through a number of existing programs such as Section 319 of the CWA, commonly referred to as the Nonpoint Source Program. As stated in the bacteria TMDL, the state anticipates the adoption of a pollution control strategy for the three waterbodies that will work to ensure the implementation of the TMDL.

8) The TMDLs have been subject to public participation.

Two forums were held for the public to comment on these TMDLs. A public workshop was held on May 11, 2006, that allowed the public to engage with DNREC representatives on the TMDLs' development and findings. A public hearing was held in the summer of 2006, which provided the public with the opportunity to comment on the TMDL. The workshop and hearing were noticed in local and regional newspapers.